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ORIGINAL PAPER

The Faustmann model as a model for a forestry of prices

Peter Deegen · Martin Hostettler · Guillermo A. Navarro

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Abstract The relation between the Faustmann model and "a forestry of prices" as a concept of thought was examined. At first, the meaning of the Faustmann model in economic sciences is the explanation of allocation and distribution by prices. The rotation age determination plays a secondary role only. Secondly, "a forestry of prices" as an application of the "free to choose" way of thinking is explained. The concept allows us to understand how individuals of anonymous groups achieve forest sustainability and provide forest environmental goods. Thirdly, the relation between the Faustmann model and "a forestry of prices" is discussed. For this purpose, the Faustmann model is described as a scientific laboratory. It helps us to observe how equilibrium arises as a non-intended result of individual welfare maximization in anonymous interactions. And conversely with the help of "a forestry of prices", we understand also that the individual maximization approach of the Faustmann model re-enacts the unintended interaction situations in anonymous group. With help of the Faustmann model, we can understand deep aspects of "a forestry of prices". Vice versa, "a forestry of prices" shows the meaning of the formal solutions of the Faustmann model.

Keywords Faustmann model · Interaction theory · Competitive market · Concept of thought · Allocation · Distribution

The Faustmann model and "a forestry of prices" as methods of cognition and their relation

"A forestry of prices" is an application of the "free to choose" way of thinking to the field of forestry.

"Free to choose" is an open concept of thought of how free individuals can overcome central human problems by voluntary interactions. Although the phrase is the title of the famous book by Milton and Rose Friedman's (Friedman and Friedman 1990), thus from a real Chicago school of economics, we will use this phrase more comprehensively. In this sense, we add up all the schools of thought of economics dealing with the institution of (competitive) markets, based on the methodological individualism, the subjectivism and do not work with constructivist (e.g., Vanberg 2001; Boettke et al. 2007). It should be clear that such a framework has evolutionary and dynamic characteristics with nearly unimaginable complexity.

"Open" means that with this concept, we cannot find a closed system of propositions like in math. Therefore, for scientific investigations, we always have to concentrate on special components of this open concept. That means we do not see the different schools strictly following the characterized methodologies as alternatives but rather as special directions of investigations (Menger 1969; Homann and Suchanek 2000). "Free to choose" is a strong and

This is one in a series of articles dedicated to Prof. Dr. Dr. h.c. Gerhard Oesten on the occasion of his 60th birthday.

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P. Deegen (✉)
Institut für Forstökonomie und Forsteinrichtung, TU Dresden, PF 1117, 01735 Tharandt, Germany
e-mail: deegen@forst.tu-dresden.de

M. Hostettler
Cycad AG, Langmauerweg 12, 3011 Bern, Switzerland

G. A. Navarro
CATIE 7170, 30501 Cartago, Turrialba, Costa Rica

innovative concept of systematic search to gain from cooperation by voluntary interactions.

The fact that forestry is selected here simply has to do with their two main problematic fields: First, long-term interactions, often in form of intergenerational relations, play a very important role in forestry. Second, forests not only play a role as a natural resource for timber and other ordinary goods, but they also are of exceptionally high importance as a natural environment for humans. Focusing the investigations on forestry really means focusing on important problems of humans, however, reduced to a relatively straightforward branch. Moreover, forestry science has a long tradition and has found essential awareness, like the idea of sustainability or the theory of intertemporal investment, which is common knowledge nowadays.

The focus on “a forestry of prices” is really a focus on two difficult and problematic fields in the “free to choose” concept with a lot of meaningful critiques, since a lot of the critique of the competitive market is not a critique of the market economy in general. Skepticism is directed toward two important “details”: Do prices in competitive markets ensure forest sustainability in the long run? Do prices in competitive markets provide enough environmental goods/services?

These objections are too important to ignore and are worthy of discussion. Therefore, in this paper, we will discuss the performance of the competitive market for forest sustainability and provision of environmental goods/services. Since an important part of these specific skepticisms results from a fundamental misunderstanding of what prices are and what they do, we will include some basic discussions.

The statement “we cannot find a closed system of proposition” is not meant to be arbitrary. Naturally, to find out scientific propositions, work with models is necessary. Modeling means the selection of special components in a concept of thought under a controlled environment to find out such consistent systems of propositions.

The interdependencies among concepts of thought and the models are not always clear. Is microeconomics a theory or a well-structured collection of models? What’s the relation between the system of propositions of the demand–supply-model and the “free to choose” way of thinking?

An extremely good, appropriate example for discussing the relation between the system of propositions in a model world to the related concept of thought is given by the Faustmann model in forestry science and the “forestry of prices” concept. We would like examine these relations in a main part of this paper.

However, before we can do this, we must introduce you to the Faustmann model. However, we do not assume that the Faustmann model is unknown or little known. But mostly, the Faustmann model is not seen as a microeconomic investment model to explain the intertemporal allocation of forests, the temporal allocation of land, and the distribution of forestry products. Since the main task of solving the allocative and distributive questions is the determination of the optimal rotation time, many scientists, researchers, and practitioners believe that the determination of the optimal rotation time is the primary objective of the Faustmann model.

Let us start with the Faustmann model, then look at the “forestry of prices” way of thinking then continue with the discussion of the relation between the model and the concept of thought.

Allocation and distribution to the Faustmann world

The scientific meaning of the Faustmann model

The Faustmann model is well accepted in economics (Samuelson 1976, 1983), and it has a “myriad” of applications (Chang 2001) with high practical relevance worldwide (Tahvonen et al. 2001); however, in a wide range of communities of forest and environmental scientists, forestry managers and other forestry-related stakeholders, there is still a very skeptical view toward this model. The skepticism is based on some fundamental misapprehensions, which we will deal with in this essay.

The main components of the Faustmann model are the Faustmann formula (Faustmann 1849) and the Faustmann–Pressler–Ohlin theorem (Johansson and Löfgren 1985: 80). The scientific purpose of the model does not consist of the determination of the optimal rotation time of forestry resources. This may be surprising to some.

This essay deals with the application of the Faustmann model in economics, in economic science. In this sense, the scientific task of the Faustmann model consists of the allocation of forests and the explanation of the distribution of forestry income. For the calculation of rotation times, this is only of marginal concern.

One of the biggest misunderstandings in the 160-year history of the Faustmann model lies in the constant confusion of its two applications, namely in forestry economic theory and in forestry operational management. The suspense-laden and alternating relations may be illustrated with the aid of two international standard reference works: On the one hand, Johansson and Löfgren (1985): The Economics of Forestry and Natural Resources. On the other hand, Klemperer (1996): Forest Resource Economics and Finance. Even though the titles of these two books are very similar, their subject content is worlds apart. The range of interpretation of forestry economics could not possibly be any greater.

Allocation and distribution are analyzed with the aid of the Faustmann model temporal as well as intertemporal. The temporal allocation deals with the question of how much of the land area is allocated to forest and how much to other land uses. Intertemporal allocation deals with the allocation of the forest to immediate or future consumption. Both allocation tasks are illustrated in Fig. 1. The same applies to distribution, because in the Faustmann model, allocation and distribution tasks are solved synchronously.

The temporal and intertemporal allocation of forests is investigated with the aid of the Faustmann model and the institutional entity of "competitive market." The allocation instruments therein are prices, and prices alone. And this creates skepticism among many forestry professionals. Is it really possible to determine the correct relation between today's and future forest utilization by means of prices? How are the extensive forestry environmental goods/services taken into consideration? In what way is the price mechanism applied in this endeavor, when no prices are available at all in this area due to market failure? It can be seen on a daily basis: Unimpeded competition and uncontrolled market result in worldwide overexploitation and deforestation—according to criticism voiced in this or similar ways.

The misunderstanding is threefold: First, overexploitation and deforestation are interpreted as a consequence of unrestrained competition and uncontrolled markets. Secondly, the effectiveness of decentralized coordination of the self-interest actions of individuals will be totally underestimated. Calls for limitation of competition and market controls, i.e. replacing decentralized with centralized coordination, become louder. Thirdly, how can the prices that reflect today's needs know the concerns of future generations?

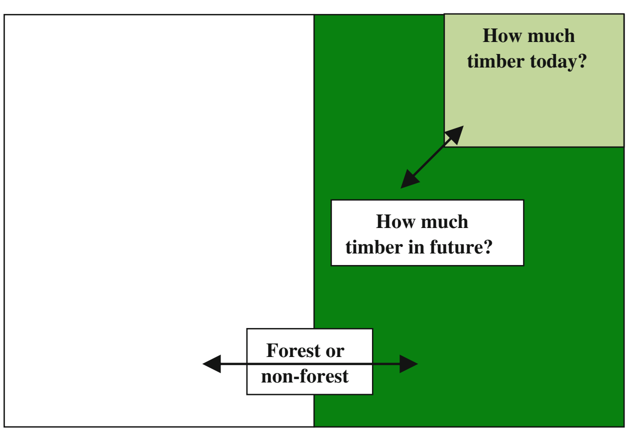

Fig. 1 The two allocative questions of forestry are: How much of the land will be allocated to forests, how much of the land will be allocated to non-forest uses? How much of the forest (timber) will be consumed immediately, and how much of the forest (timber) will be saved for future consumption?

In short, the Faustmann model is not being rejected, because it poorly reflects the allocation and distribution of forests through competitive markets, but because a price-driven forestry is just as unable to solve the problems of future generations as those of the environment. According to usual criticism, a price-driven forestry, illustrated by the Faustmann model, will result in rotation times that are much too short, to clear-cutting, and even-aged forest stands.

Intertemporal allocation

As mentioned previously, many forestry specialists believe that the ultimate goal of the Faustmann model is to determine the rotation age, due to the fact that a large body of textbooks and papers in forestry economics deal with this subject. However, the scientific question closely related to this is the question of intertemporal allocation of forests, which is to solve the question of "how much of the forests should be consumed now, and how much of it should be saved for future consumption?" In such case, calculating the optimal rotation age would be a necessary, but insufficient step.

Therefore, if we want to find out the relation between the harvesting area for present timber consumption (a_c), as well as the area reserved for future timber consumption, an equation as a relation between these two types of areas is necessary. Equation 1 shows that a_c can be calculated by dividing the total land area (A) by the optimal rotation age (T^0) as follows:

$$a_c = \frac{A}{T^0} \qquad (1)$$

Clearly, this equation does not consider the effects of the forest age structure and its movement in time. For such investigations, see e.g., Salo and Tahvonen (2004) and Tahvonen (2004).

However, for the explanation here, Eq. 1 is a helpful simplification and focuses our mind on the relation between harvested area, total forest area, and rotation time. This equation shows how the optimal rotation age determines the relation between present and future timber consumption. If we assume the optimal rotation age is 100 years, the area for present timber consumption is 1%, and the area of the forest saved for future consumption is 99%. If the optimal rotation age is 50 years, the area for present timber consumption is 2, and 98% of the area will be consumed later. And finally, if the optimal rotation age is 10 years, then the relation between present and future consumption would be 10:90.

The main message of the described relation between present and future harvested forest areas would be that the optimal rotation age exactly characterizes the relation between present and future consumption of the forest products determined by the prices of both productive

factors and products (mostly timber). Therefore, the Faustmann model is fundamental for analyzing the intertemporal allocation of forests by prices. Whether forests should be allowed to grow or should be harvested is a result of prices and of prices only, because in the Faustmann world, there is no place for any other decision criteria.

With this model, we are able to analyze in which direction the relation between the present and future consumed forest area changes when the prices of productive factors and the products change. This is possible with the comparative static analysis of the Faustmann model (e.g., Johansson and Löfgren 1985: 83). For instance:

> If timber prices increase, more forest area will be consumed today, and less area will be saved for future timber consumption.
> If wages increase, less forest area will be consumed today, and more area will be saved for future timber consumption. If interest rates increase, more forest area will be consumed today, and less area will be saved for future timber consumption.

In the same manner, a comparative analysis is possible by using the generalized Faustmann model (Chang 1998).

Temporal land allocation

In the same manner as the intertemporal analysis, land allocation analysis based on prices can be done, as well (e.g., Strand 1969). In order to show the principle of how prices determine land allocation between forestry and non-forestry land uses, we must assume, for simplification, that there would only be two types of land use: plantation forestry and annual crop agriculture. In land use allocation, the Faustmann model plays an important role, too, if forestry and agriculture are competing for use of the same land. Forestry can be a competitive land use, as long as the NPV of bare land under forestry would be higher than the NPV of bare land under agriculture, or visa versa (Fig. 2). The land price equilibrium is at the point were both NPV's are equal. The point where the two NPV curves cross shows the relation of how the land is allocated between forestry and agriculture (Hyde 1980).

Figure 2 shows the allocation of land based on variations on wages that change the land use between forestry and agriculture. Therefore, the more land is used for forestry, the less land is used for agriculture, and vice versa. Therefore, the NPV curves for forestry (NPVF) and agriculture (NPVA) decrease with a decrease of land extension for each particular use. The low wage situation (1) is represented by the solid black lines. The intersection in the direction of the abscissa describes the optimal land allocation. The intersection in the direction of the ordinate describes the equilibrium of land price.

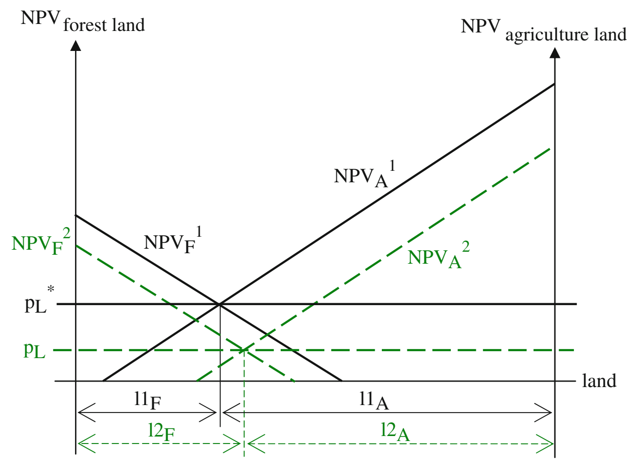

Fig. 2 A graphical analysis of land allocation between two land uses (forestry and agriculture) showing how variations of wages change the land use between forestry and agriculture and shifts land price equilibrium

Let us examine how price variations changes the land allocation between the two land uses discussed previously. As an example, we pick out the labor price, or wages. Now, let us assume an increase in wages. If the wages are high, forestry and agriculture NPV curves, represented with the green dotted lines (2), are below both low wage NPV curves. Since agriculture is more labor intensive than forestry, the agriculture higher wage NPV curve situation is at a greater distance from the agriculture low wage NPV curve than the distance of both forestry NPV curves. The equilibrium land allocation in the high wage case leads to more land for forestry than for agriculture, and the equilibrium land price will decrease. The land price for the high wage is less than the land price for the low wage situation under equilibrium conditions.

Distribution

In addition to the previous allocative solution, we can also solve the problem of income distribution in forestry at the same time. Thus, it would be useful to make this implicit income distribution from forestry evident. The famous Knut Wicksell had used a forest model similar to the Faustmann model to explain the distribution of national income (Wicksell 1893). At this point, we demonstrate the income distribution inside the Faustmann model with help of a simple numerical example. For that purpose, we represent the basic Faustmann model as an income table:

$$\mathrm{NPV}_F = -c_{\mathrm{aff}} + \frac{R_{\mathrm{t}}(T) - C_{\mathrm{h}}(T)}{\mathrm{e}^{rT}} + \frac{p_{\mathrm{L}}}{\mathrm{e}^{rT}}; \quad \mathrm{NPV}_F = p_{\mathrm{L}} \tag{2}$$

For illustrative purposes, we fill out the model 2 with figures:

Table 1 The figures of the Faustmann model/03/rearranged as an income sheet

Income distribution		Income formation	
Land income (p_L)	136	Revenues from timber ($R_t(T)$)	70,000
Labor income		Revenues from land	136
Afforestation (c_{aff})	1,500		
Harvesting ($C_h(T)$)	30,000		
Capital income (e_rT)			
Labor invested	$1,500(e^{0.04\times80}-1)=35,300$		
Land invested	$136(e^{0.04\times80}-1)=3,200$		
Total	70,136	Total	70,136

$$136 = -1,500 + \frac{70,000-30,000}{e^{0.04\times80}} + \frac{136}{e^{0.04\times80}} \quad (3)$$

(Please consider: If land markets are in equilibrium, then (Klemperer 1996, p. 209): $-1,500 + \frac{70,000-30,000}{e^{0.04\times80}} + \frac{136}{e^{0.04\times80}} = -1,500 + \frac{70,000-30,000}{e^{0.04\times80}-1} = 136$) Finally, we move the figures of the Faustmann formula into an income sheet (Table 1).

Table 1 shows how forestry income is distributed among land, labor, and capital owners. What we have done in this section is to describe and analyze, with the help of the Faustmann model, how forestry based on prices may work. We have examined how a society solves the intertemporal allocation of forests between present and future, allocation of land between forests and non-forests, and also the distribution of income coming from the sale of forestry products by using market.

A forestry of prices

Cooperation in the anonymous large society

"A forestry of prices" as an application of "free to choose" is a theoretical concept for cooperation in large anonymous groups, as modern societies are. It explains how to solve the problem of coordination and motivation in such anonymous societies of free people. It is true that this concept is just theoretical, because a forestry of prices is not so easy to observe empirically. The forestries of the world are far from a real forestry of prices. And therefore, empirical evidence is not that easy to find (cp. Hayek 2002: 10). However, "a forestry of prices" helps us to see forestry through the lenses of prices, and therefore it has been considered a really innovative concept (Friedman and Friedman 1990), particularly if we think about the alternative, to control people's behavior as a continuous procedure in marginal steps into tyranny (cp. Friedman and Friedman 1990: 38 et sqq.).

Economists are still confusing people when talking about prices as a mechanism. Thus, prices are looked at as an automaton, a technical installation of social engineers or as the invisible hand that operates markets. With such perceptions, people start to associate a mystical or unidentified power with markets. However, prices are more tangible. They are the result of the voluntary exchange among individuals.

Therefore, the timber price is not a given, it is a result of cooperation among individuals. It is a result of interrelations among individuals, where some individuals evaluate timber relatively low, and some other individuals are evaluating timber relatively high in comparison with other goods. The first group exchanges timber for other goods, while the second group exchanges other goods for timber. The relation of how much timber is paid for other goods or, in reverse, of how many other goods are paid for timber is called "price".

The same thing happens with the price of capital, which is interest. One of the main critiques of a forestry of prices is directed mainly toward interest as an important cost factor for long-term investments. However, the never-ending discussion of interest cannot be the subject of this paper. The best literature for understanding that subject is the famous "theory of interest" by Fisher (1930). For positive context here, it is useful to agree that the interest rate is a result of the voluntary exchange of different income streams among individuals. As Hirshleifer (1970) pointed out, the interest theory is only an application of the price theory.

Interest and all other prices are always located in the sphere of conflicts of use among individuals. Therefore, this field of human relations is very sensitive and full of troubles. However, there are generally two different ways to solve conflicts of use: war or cooperation. Exchanges with the help of prices, we should not forget this, are cooperative and also peaceful ways for the solution of conflicts of use. More specifically, prices are a social institution that helps us to overcome the dilemma structure[1]

[1] With the "dilemma structure" Homann and Suchanek (2000), p. 35 pp) characterize the interaction of individuals with mutual and conflictive interests at the same time, so that mutual gains systematically fail. The concept of "dilemma structure" constitute economics.

as the fundamental problem of cooperation between individuals.

Often enough, a forestry of prices is criticized as an egoistic economic model, which is only based on cost-benefit valuations of the 'homo economicus.' In this picture, market exchanges under competition and cooperation are sketched as contradictions. However, competitive market exchange is a kind of cooperation.

In his wonderful speech, Friedman (1990) explains the gigantic people's cooperation in competitive markets by the example of how an ordinary pencil is made: let us look at the pencil machine: it is made from steel, produced anywhere in the world. The steel in turn is made from ore. Miners, maybe in Brazil, in the Ukraine, in Canada, or anywhere have mined it. Sailors or truckers have transported the ore and the steel and the pencil machine and the pencil. Or, look at the wooden material of the pencil: it may have come from a German or an Indonesian forest or from a plantation in South Africa. A lot of knowledge and continuous management over a long time are necessary that forests can grow for timber to produce an ordinary pencil. Or, look at the different colors of the pencils, or the tip of the pencil. All the different components are the results of the work of hundreds and thousands of specialists.

"None of the thousands of persons involved in producing the pencil performed their task, because they wanted a pencil. Some among them have never even seen a pencil and would not know what it is for. Each saw his work as a way to get the goods and services he wanted—goods and services we produced in order to get the pencil we wanted. Every time we go to the store and buy a pencil, we are exchanging a little bit of our services for the infinitesimal amount of services that each of the thousands contributed toward producing the pencil.

It is even more astounding that the pencil was ever produced. No one sitting in a central office gave orders to these thousands of people. No military police enforced orders that were not given. These people live in many lands, speak different languages, practice different religions, may even hate one another—yet none of these differences prevented them from cooperating to produce a pencil. How did it happen?" (Friedman 2000: 1.3, 1.4) "It was the magic of the price system—the impersonal operation of prices that brought them together and got them to cooperate to make this pencil, so that you could have it for a trifling sum.

That is why the operation of the free market is so essential. Not only to promote productive efficiency, but even more, to foster harmony and peace among the peoples of the world." (Friedman 1990).

Anyhow, many people do not see the competitive market as a kind of cooperation. Why? What is the underlying misconception?

Mostly, the association with cooperation is linked to small and anonymous groups of people, however, it is often forgotten that there has been a radical change in human society in the last centuries, and the concept of cooperation under this situation provides no clear meaning in anonymous large groups, as the human society has evolved (North 2005). In contrast to a non-anonymous group in large anonymous groups, individuals do not recognize the existence of reciprocal influence among their actions in interacting situations (Brennan and Buchanan 1985, p. 1). To save a tree for your own daughter or son is a totally different situation than saving a tree for any stranger in the next generation anywhere in the world. While in the non-anonymous group, everybody anticipates the reciprocal character of his actions, individuals in the anonymous group react to impersonal exogenous parameters. However, also in the anonymous group all, market results are outcomes of the complex interdependencies of all actors of the group (Brennan and Buchanan 1985, p. 1 f.). As Smith (1789) had implicitly pointed out, those special issues of cooperation in large anonymous groups are how to overcome the problems of incentives when nobody knows anybody and how to coordinate the extreme diversification of knowledge in societies with millions or billions of individuals.

What is needed nowadays, are concepts to help us to understand the behavior of such anonymous groups in an open global society. Problem solving is not possible with instruments developed for a direct "personal exchange" in non-anonymous groups. "There is the ever-present danger that the rules of 'personal exchange' will be applied inappropriately to govern or modify the extended order of markets." (Smith 2002: 554).

A forestry of prices is a theoretical scheme for cooperation in such anonymous groups. They can be a really innovative scheme to understand forestry in an evolving world. This scheme also allows us to understand how individuals in anonymous groups achieve forest sustainability and provide forest environmental goods/services.

Forest sustainability

The use of the term "sustainability" in the following section should not be confused, because this word is used in both the modern debate of "sustainable development" and in the traditional field of "forest sustainability". Although the two concepts interact and interfere with each other, they should be clearly distinguished. While "sustainable development" is a concept of the whole society mainly with respect to intergenerational equity, "forest sustainability" is more a concept for the use of a renewable resource (the forest) by covering biological self-reproduction in the long run (infinitely) (Deegen 2004: 14 et seq.).

One of the main mistrusts toward a forestry of prices is how such forestry can safeguard forests in the long run. Can present prices inform us, what we should do in future? Can profit maximization support sustainable actions of forest owners? Normally, the answer of forestry experts is "no". Therefore, they look for alternatives.

However, the main problem in the long run is the unpredictability of the future.

This is due to changes in people's wants and preferences, the growth of knowledge and sciences, developments in technologies, shifts in society's institutions and maybe due to changes in the natural environment as well as other sources. In order to imagine these huge changes, it is helpful to look back to 100 years ago (only one rotation time): there was no plastic to manufacture buckets, tubs, kitchen units, window frames, doors etc. There were no trucks to transport timber, no chainsaws, and no harvesters. Instead of TV and radio, people bought newspapers two or three times a day.

However, not only the many different changes are unpredictable, first of all, the millions of interdependencies between the different factors are absolutely unimaginable and truly unpredictable. Economic textbooks are full of examples with unforeseen effects of single changes (e.g., Siebert 2001).

As far as this unpredictable future is concerned, no one knows what action to be taken will be the correct one, and therefore, no person, no committee, or no commission is in the position to have a plan to manage the forest for future needs under future conditions. This is one of the main mistakes made in traditional and present discussions in forest sustainability, to believe that some people may have this knowledge. In fact, they substitute the gigantic network of the bilateral exchange of billions of people with some planning of the forest's natural yield and by organizing a more or less constant long-term timber flow from the forests to the household.

Timber prices reflect worldwide timber needs much better than any kind of timber statistics, and any regional plan will ever be able to. Capital prices (interest) reflect the time preferences of mankind much better than social planners ever can. In reality, it is just a gigantic illusion of intellectuals to be able to master the unknown future; moreover, it is really an inapprehensible "pretense of knowledge" (Hayek 1974).

Mastering the unpredictable future will require the mobilization and the involvement of the creative capacity of the 6 billion people on earth. In relation to this gigantic reservoir, the capacity of any commission, any expert network, any "earth conference" can really only be a poor attempt. Mastering the future will require institutions to boost the creativity of all individuals. James Buchanan and Viktor Vanberg have shown that the competitive market itself is "a creative process that exploits man's imaginative potential" (Buchanan and Vanberg 2001: 112).

Notwithstanding the creative capacity of mankind, it is insufficient to be able to control the complex processes in society and nature. Unanticipated changes cannot be prevented. Moreover, the passage through time is full of unanticipated changes. "It is useful to recall at this point, that all economic decisions are made necessary by unanticipated changes …" (Hayek 2002: 17). This means that the concept of sustainability must solve the problem of how people act or react to unanticipated changes.

In this context, the first task of sustainability is to discover what facts have changed: is wood for pulp and paper more valuable when used as bio-fuel? Do forests for timber production have more value as a biodiversity reservoir? Does land used for forestry have a higher value when used for agriculture or for urban development?

The second task is to determine the best response to those changes. For instance: when we consider the extreme development of labor costs in the last third of the twentieth century, as well as the extreme technological changes in logging and transportation in the last two decades, and also the extreme developments in the global capital market, it is clear that silviculture as a forestry technology must undergo extreme change.

The third task is to monitor that change. What part of our knowledge and capabilities is helpful to adapt to the new circumstances, and what should be rejected?

For all these tasks, there is no single correct answer, no general rule, no indicator and no expert system. "That society that permits the maximum generation of trials will be most likely to solve problems through time." (North 1998: 81) Decentralized decision-making processes encourage manifold creative trials. The competitive market is such a decentralized "procedure for discovering facts which, if the procedure did not exist, would remain unknown or at least would not be used." (Hayek 2002: 9).

When monitoring the unanticipated change in prices, it shows people, "that what they have previously done, or can do now, has become more or less important." (Hayek 1968/2002: 17) The need for adaptation will be enforced by the changes in compensation for the various services. (Hayek 2002: 17) There is no voluntary decision or deeper insight, but a must to accept the new compensation condition, felt by the change on their own living conditions. "The most important function of prices, however, is that they tell us what we should accomplish, not how much. In a constantly changing world, merely maintaining a given level of welfare requires constant adjustments … (Hayek 2002: 17). This is exactly what the main task of any concept of sustainability is.

Although competition has been thoroughly discussed in economic literature as well as in different texts in forestry,

there is a deep suspicion among forestry experts toward competition as an institution to realize sustainable forestry in a world of unanticipated changes. Moreover, the paper by Schanz (1996) contains no advice that state foresters in public forestry services consider competition in any form as an institution of sustainability.

Many foresters argue to the contrary. They argue for a more constant forestry. Sustainability in forestry can best be guaranteed with the help of conventional "Forsteinrichtung"[2] (forest management planning and forest regulation) (Schanz 1996). Although this concept is generally accepted in many forestry traditions worldwide, it works with the hidden assumption of certain future conditions. Therefore, this "Forsteinrichtung" is a well-working prescription in times under constant conditions. However, how forestry could secure sustainability in times of unanticipated changes? To follow this principles, there is no signal that changes are about to occur, and also, there is no a process to support adoption in the direction of the new circumstances. In moment of unanticipated changes, the instruments of conventional "Forsteinrichtung" maybe suggest to do the opposite, hindering forestry to adapt to the new circumstances.

We should keep in mind, that prices in the competitive market inform us how resources have changed in the past. This can be good or it can be bad, but prices call for adapting. And this is exactly the task of forestry specialists. Without any adaptation, economic survival of forestry in an evolving world is impossible. Ironically, it is precisely this concept of a constant, well-planted forestry that prevents forestry to achieve sustainability.

Forest environmental goods/services

Although the competitive market is accepted in general, there are some essential exceptions concerning the environmental side of forests in detail. Two main points are:

Competitive markets work well, but people do not act responsibly: owing to the complicated and complex interrelation between men and biosphere, common men/women evaluate the environment insufficiently or wrongly. From this follows that market prices, as a result of many widespread (insufficient/wrong) wants of thousands and millions of more or less irresponsible people, cannot tell what these people really need. Therefore, a forestry of prices is unable to find a line between responsible and irresponsible behavior.

People may act accurately, but market failures lead to the provision of less environmental forests. The two exceptions will be discussed in the following.

[2] A discussion about the translation problem of the German term "Forsteinrichtung" is published in Hummel (1995), p. 288.

Paternalistic wants

Many people like forests much more than just as a source of timber: in many places of the world, farmers want to use forestry land for agriculture, millions of tourists like outdoor recreation in forests, millions of people see forests as a gigantic reservoir for ecosystem services like water protection, scenic beauty, biodiversity, and nowadays, forests are seen as an important source for carbon sequestration and climate control. It becomes clear that the wants of millions and billions of people in relation to forests are very broad, different and even conflicting.

Which of the wants are better than the others? Is biodiversity protection better than turning the forestland into farmland? Is timber for pulp and paper better than timber to produce bio-energy? Which of the wants of which people should be satisfied, and which ones should not?

Forest managers, land owners, environmentalists, and other forest stakeholders prefer forests and forestry goods/services to a rather larger degree than other, mostly much larger, groups of individuals in society. And rightly so. But shall these forest specialists make decisions on behalf of other individuals, just because they are the specialists in this field? They know the function of forests in climate stabilization; they know the importance of biodiversity to the ecosystem as a life support system for mankind. And they see that many individuals prefer quite different things and value a lot of other subjects in society much higher than forests and forestry goods/services. Often, the questions are: do individuals really prefer land changes from forest to other land use alternatives? Do individuals not need as much biodiversity, while changing natural forests into poor-tree-species forests? Why do forest owners produce so many forests with less beauty and less ecosystem services?

Often, many forest specialists do not understand why many individuals so much under-evaluate forests as life support systems. Therefore, often they do not accept what other individuals prefer or even do not prefer. They argue that many people act irresponsibly: they destroy our common environment, they deforest or overuse forests, and they degrade forest lands. In this sense, paternalism is inescapable for those who are not responsible. Only the forest specialists know what people really need and therefore, they want to impose a better standard for all (Buchanan 1999a, b: 84). The "economic research" in this context is to find out social engineering solutions to rule the people by carrot and stick for the right ecological behavior. These are typical observations of daily politics. And, the reasons for such are sometimes accepted deep within us. But exactly this chain of arguments is a shift into the methodology of elites and an important step on "the road to serfdom" (Hayek 2001). The consequence of consequent

paternalistic is the case of dog eats dog, because everybody thinks he is right.

By contrast, the methodology of individualism acknowledges the mutual existence of fellow men, who also have values, and he violates his precepts at the outset when and if he begins to assign differential weights to men (Buchanan 2001: 7.13). "Each man counts for one, and that is that" (Buchanan 2001: 7.15). In this methodology, there is no place for any paternalistic ground. Environmental forests are not the result of objective standards founded by specialists. The methodology of individualism understands the provision of environmental forests as results of volunteer contracts between different individuals, with differences in wants, values, and endowments.

Market failure approach

Aside from paternalistic reasons, so-called market failures another group that let us formulate pretexts why a forestry of prices cannot work well and play an important role in environmental economics.

Wedge between private and social wants: One line of thought deals with the wedge between what individuals want privately, and what society wants as a collective (so-called social wants). Why should individual wants and collective wants differ? All human wants, individual and collective, are based on the wants of individuals. There is no source other than the wants of individuals. In an empty classroom, there is no social want. The social want of three students concerning the topic that the lecturer should teach is the result of unanimous agreement of the three students. The individual dissatisfaction of the results of such unanimous agreements sometimes arises, because the single individual regards his own wants as more important than the individual wants of the other group members: my own preference for biodiversity is more important than the want of my neighbor for a new teak wood cabinet. It is easy to see that this kind of discrepancies between individual wants and collective (social) wants is only a "reincarnation" of paternalistic thinking, where some individuals have a greater weight than others.

However, the result of unanimous agreement ("social want") normally differs from the preferences of single individuals: let us suppose that student A has the preference order (math $\succ$ biology $\succ$ history), student B (history $\succ$ math $\succ$ biology), and student C (biology $\succ$ history $\succ$ math). It is easy to see that every collective (social) solution will entail certain dissatisfaction on the part of two students. Whatever the collective result is, two students prefer another topic more than the collective solution does. In this case, we have a divergence between the individual and the collective wants. However, this is not a result of the market, in fact, it is a result of a collective process. The discrepancy between individual wants and social wants is typical for results of political institutions, but not of the institution of competitive market.

In a "classroom of prices", every student chooses his individually own best topic and bears the consequences: to pay the lecturer. In this way, every student chooses his own individual optimum.

An important reason for collective consumption is cost sharing. Students choose the collective consumption of teachings and share the costs. At this moment, we see the two alternatives: to choose a topic exactly to one's own individual preferences. The consequence is to pay the total costs. Or share the costs. The consequence is to find out the topic collectively. We see, this is a very well-known procedure, to choose between alternatives. Here, in this special case, choosing between two alternatives, first to choose the individual topic and pay the total costs or second to realize a collective topic and pay only a portion of the costs. But what does this have to do with market failure? Maybe it is a thinking failure: to prefer the individual topic and liking cost sharing too, to prefer an extra level of biodiversity and liking that others pay, liking the cultural advantages of the city, and the silence of the virgin forest at the same time. "Free to choose" and "free to dream" are two totally different things.

Externalities: It can often be found in textbooks that externalities are the cause for the wedge between individual wants and social wants. Really, the "externality" is one of the great discoveries in modern economics, found and published by Cecil Pigou (1932) (first edition 1920). Since those days, much scientific work has been done to understand what externalities are. In the seminal paper "Toward a property rights", Demsetz (1967) explains externalities as non-regulated conflicts of use. Overcoming such conflicts of use is possible by implementing property rights. But, this is exactly the basic condition for every bilateral exchange at the marketplace: without property right, no exchange is possible. The non-existence of a well-working property rights regime in the society, however, is not a market failure, in fact, it is a failure of politics.

A good example for this kind of confusion can be found in "Environmental Economics" by Hanley et al. (2002: 22 et seq.): they describe the deforestation in Madagascar as an example of market failure. About the factors leading to habitat destruction and the loss of biodiversity, they write: "First, habitat destruction arises from public ownership of large areas of land with open access property right regimes … Second, land tenure is often insecure …" (Hanley et al. 2002: 22). It is easy to see that these two factors are examples of political institutions that do not work rather than examples of market failures.

Sometimes, open property rights situations will be not solved, because the definition, negotiation, enforcement, and protection of property rights are not without costs.

Often enough, the costs of property rights are higher then the benefits that come with them. In these cases, the open situation is already the efficient (social optimal) solution. Not every open property rights situation is worth solving.

Or, in the opposite view: every property rights situation has a lot of open areas, a lot of non-defined elements. This is the consequence of transaction costs. Nothing in the real world comes without costs. However, the imperfectness of any property rights bundle is not a reason that exchange cannot work. Rather, the imperfectness of property right situations is typical for all market exchange situations.

Competition is a procedure for the discovery of unexploited opportunities. This discovery is not only confined to productive forces of technique and technology. They involve economic innovations like limitations of liabilities, mechanisms to conformance of contracts or improvements of the mobility of capital as possibilities for reducing transaction costs as North (1998: 39 et sqq., 149 et seq.) has pointed out, too. Imperfect property rights situations are not market failures, they are reasons why we need the competitive market: to discover what the best forms of exchange under certain circumstances are.

Public goods characteristics: Another market failure is based on the existence of non-exclusion and non-rivalry, two public goods characteristics. In case those goods have these characteristics, the market fails totally or does not work efficiently (Musgrave and Musgrave 1980). Although a general critique is necessary and will be done in another paper, right now, it may suffice to quote some arguments by Buchanan (1999a, b). He deals with this subject in both chapter three of the seminal work “The Limits of Liberty” (Buchanan 2001) and the study “The Demand and Supply of Public Goods” (Buchanan 1999a, b).

Non-exclusion is not a good characteristic, as described in mainstream textbooks. Instead, non-exclusion is a (social) institution of individuals for solving conflicts of use. Exclusion is a consequence of property; property comprises the right to exclude other individuals from consumption. The condition for such exclusion is the existence of property rights, their mutual acceptance, and their effective enforcement. Without these conditions, exclusion is not possible, neither for individually consumed goods nor for collectively consumed goods.

What we would like to say here is, that exclusion/non-exclusion is a part of the property right problem, which we have discussed earlier under the keyword of “externality”.

Also, rivalry/non-rivalry is not a problem of good characteristics, it is a social institution to solve conflicts of use, like before. As we have explained in the paragraph “wedge between private and social wants”, the main point in choosing between individual and collective consumption is the comparison between the advantage of cost sharing and the disadvantage of utility reduction by collective consumption and the advantage of full utility realization and the disadvantage of paying the total costs. Most goods of the world can be consumed individually as well as collectively. That has nothing to do with technological goods characteristics, but with individual cost-benefit considerations. James Buchanan (1999a, b) has shown this in two ways. First, he has demonstrated that the public goods theory is applicable to all goods, individually and privately consumed. Second, he has shown, using the examples of Mosquito repellent and fire protection, that rivalry/non-rivalry has a wide variability of proportions in the “degree of publicness”.

As mentioned previously, the critique of the mainstream theory of public goods as a theory of goods characteristics cannot be developed here fully, because of limited space. For the moment, it is helpful to understand that exclusion/non-exclusion and rivalry/non-rivalry are not goods characteristics, but different kinds of social interactions. At this moment, we change the thought and do not ask anymore under which goods characteristics markets work or markets fail. Instead, we ask why individuals sometimes choose exclusion and sometimes choose non-exclusion; and why individuals sometimes choose rivalry and sometimes choose non-rivalry. Only then we will understand the role of the institution of competitive market as a discovery procedure, and which type of interaction solves the dilemma problem (coinstantaneous existence of mutual and conflictive potential in an interacting situation) in a satisfactory manner.

The mainstream theory of pure public goods is highly restrictive. “Strictly speaking, no good or service fits the extreme or polar definition in any genuinely descriptive sense. In real world fiscal systems, those goods and services that are financed publicly always exhibit less than such pure publicness. The standard examples, such as national defense, come reasonably close to descriptive purity, but even here careful consideration normally dictates some relaxation of the strict polar assumption. It is evident that the whole theory would be severely limited, if it were to stand or fall on the correspondence of this purity assumption with observations from the real world.” (Buchanan 1999a, b: 48 et seq.)

This though, is extremely helpful for global environmental problems. There is no world-government to correct market failures by provision of global public goods. However, by dry analysis, we do not find a pure global public good. Also, global biodiversity, global climate change, and global deforestations have degrees in publicness and in rivalries below the extreme polar definition.

Conclusions for forest environmental goods/services:

The objection is that most of forest environmental goods/services are leading to market failures, and that these are

strong reasons why a forestry of prices cannot work well and should be considered respectfully. From a theoretical point of view, the market failure approach as a main theoretical base of modern environmental economics supports this way of thinking. However, in the last 50 years, an increasing body of literature, particularly in the subjects of externalities and property rights, of public finance, and the public goods, gives motive for qualms.

On the one hand, we find the service state in fields where the market works as well where the market fails. On the other hand, we find market failures where the state corrects as well where the state does not correct. It is easy to see that the market failure approach cannot explain the state activities as consequence of market failures. The market failure approach fails as positive theory to explain of the service state Blankart (2006: 71 et seq.). It is more a litany of reasons for the compurgation of state activities than a positive theory for explaining the service state.

Market failure is not a failure of markets; instead it is a failure of our thinking concerning markets.

Economics as theory of interactions speaks another language: individuals mainly have two ways to interact (peacefully): one is through step-by-step alternating adaptation of individual plans; the other is through political processes. The first is a gigantic network of bilateral exchanges; the second is a gigantic process of hundreds and thousands of collective agreement procedures. The first is called market, the second is called politics. Both must solve the dilemma problem (coinstantaneous existence of mutual and conflictive potential in an interacting situation) (Buchanan 2001; Hayek 2002; Homann and Suchanek 2000).

In cases where the organization of the political agreement processes is the state, another difference to the market exists: while markets are based on voluntariness, the state has the power to solve interaction problems by coercion. Therefore, this will be accentuated, since the choice between market and state as two fundamental institutions to provide goods/services is not only a technocratic decision for efficient solutions of transaction costs, it is a principal decision for the basics for freedom in society.

Result of a forestry of prices

A forestry of prices is not only a concept of thought for solving ordinary problems in anonymous groups of individuals. Also, for central forestry problems of sustainability and environment provisions, it gives us essential directions to overcome these kinds of cooperation.

A forestry of prices helps us to think about the main problems in sustainability, how to manage the unpredictable future and how to adapt to unanticipated changes.

A lot of problems in the environment sphere of forestry have paternalistic reasons. New concepts based on this thought have nothing to do with a society of free people. A forestry of prices helps us to differentiate paternalistic concepts from the methodology of consequent individualism. It also helps us to systematically look at how people can solve the interaction problems by step-by-step alternating adaptation of the individual plans. It is therefore an alternative concept of thought to the market failure approach.

The Faustmann model as a laboratory

The way of cognition

After it has now become apparent that a forestry of prices must be thought of as an evolutionary and dynamic institutional entity of unmanageable complexity, the question poses itself in what way the Faustmann model, which in its core consists of two quite simple mathematical relations, is able to represent such an entity at all.

The sought-after results are not only to illuminate the relation between the Faustmann model and the concept of thought “a forestry of prices”, but in addition should lead to basic relation between microeconomic models and the concept of thought “free to choose” by means of an example.

Is the Faustmann model able to comprehensively represent “a forestry of prices”? This question can simply be answered with no.

However, this answer does not only apply to the Faustmann model. It also applies to any other model. While a thought represents the fundamental choice of a certain approach, the models applied within are self-contained units, in which conclusion systems free of inconsistencies are developed according to strict rules (see Homann and Suchanek 2000: 26 et seq.). Here, models are not tied to a single concept of thought, but are relatively independent. This means that not infrequently these same models are imbedded in different concepts of thought. When this happens, in spite of identical structure, they result in different interpretations or lead to different consequences:

The fact that the same model results are often interpreted differently, and that different consequences are derived from them is in most cases related to the fact that they are imbedded in different concepts of thought.

For that reason, it is entirely out of place to criticize the Faustmann model for being limited. Because it is exactly these limitations that enable us to recognize one of the sides of forestry at all. What side that is, we would like to discuss now.

The analogy of laboratory

The equilibrium analysis and the interpretation of its results are time and again a source of the greatest confusion. For that reason, we would like to describe the equilibrium analysis as a laboratory.

However, no experiments with real people are conducted in this laboratory, as is common in experimental economics, but only experiments with thoughts. However, since our thoughts are frequently not very organized and because of that produce a lot of inconsistent statements, they require the disciplining hand of mathematics.

The mathematical model, in our case, the Faustmann model, corresponds to a test setup for an experiment. And, that setup may be suitable or less suitable. The "fine art" of the experimenter is in the choice or design of a well-suited test setup. When, for example, Galileo used the leaning tower of Pisa to measure the free fall speeds of various test specimens, this was, owing to the measuring accuracy at the time, an unsuitable test setup. In contrast, the inclined plane he later designed was better suited for his purpose.

The requirements for the design of a well-suited mathematical model are not much different. For example, anyone who uses a Faustmann model as a "test setup" to investigate how the deforestation of a region, in which the land represented "open access", has come about, has designed a poorly suited test setup. It is as if he had attempted, to use an analogy to Galileo, to determine the gravitational acceleration in a gravitation-free environment.

Nature is studied in greenhouse laboratories with the aid of experiments. At first glance, this appears to be quite strange. Because when one enters such a laboratory, one may find that many times natural products are not the subject of studies, but frequently specially produced ingredients. In addition to that, these special ingredients are not being studied in their natural environment, but once again in specially constructed devices and laboratory setups. And in spite of all that, natural scientists regard the laboratory results as being valuable for the study of nature (Knorr-Cetina 1981). This is not much different with the Faustmann model. There, results are achieved about the function principle of an equation or equation system, which we assume will contribute to our understanding of human interactions.

The method of laboratory experiments is not suitable for understanding the complexity of nature as such. Rather, laboratory experiments allow the selective examination of very special relations between cause and effect. For example, it may be possible to study the effect of a certain mineral on the vertical growth of a plant by means of an experiment. For that purpose, a number of plants are exposed to that mineral, while a comparison group is not. In order to find out exactly what effect this mineral has on vertical growth, all other experimental conditions, such as temperature, light, composition of the soil, possibly even the genetic make-up of the pants, must be maintained constant. Only in this way it will be possible to recognize the effect of this single variable on the growth of the plants.

Experiments in the "Faustmann lab" are conducted analog to this (see section "The Faustmann model and "a forestry of prices" as methods of cognition and their relation"). Here, too, one variable (cause) is changed at a time, in order to discover, how another, also selected variable (effect), is going to react. If, for example, the interest rate is reduced from 0.04 to 0.02% in Eq. 3, the crop yield value will rise from € 136/ha to € 8,239/ha. This would have resulted, as we have seen in section "The Faustmann model and "a forestry of prices" as methods of cognition and their relation", in a change of the land use in favor of forestry, in our laboratory and under the condition that all other variables of the "Faustmann lab", such as proceeds from timber, reforestation costs, timber harvesting costs, and rotation time are kept constant.

This analysis technique, i.e. studying the changes of one variable by changing of another variable, while at the same time maintaining all other variable constant, is well known in economics as the Ceteris–Paribus analysis.

Neither in the greenhouse laboratory, nor in the "Faustmann lab", do the artificially created constant conditions represent any simulation of the real world. Neither in the greenhouse laboratory, nor in the "Faustmann lab", any claim is made that, by tying down all variables with the exception of a single one, all test objects in the real world will react exactly in this way and only in this way. The Ceteris–Paribus analysis is a technique for the acquisition of knowledge, but not a creation of a miniature world, or a reflection of the real world. This has already been explained marvelously by Johann Heinrich Thünen in his "Isolated State": "The laws that apply here cannot be transferred directly from experience, because in reality, we are faced everywhere with inhomogeneity of the soil, varying degrees of richness of the same, the effect of navigable rivers, etc., and in the economies that we see at various distances from the large commercial towns, the influence of all these potentials—provided the consequence of economic activities—has a unified effect. In order to free the effectiveness of one potency from the conflict of the other potencies and thus enable recognition, we have had to assume a large city without a navigable river on a plain of homogeneous and uniformly fertile soil." (Thünen 1990: 405).

The same applies to an analysis in the "Faustmann lab". So, when Johansson and Löfgren (1985: 95 et seqq.) study the influence of taxes on the intertemporal allocation of a forest, they do not make a claim on how real people react to tax changes in the real reality. The possibilities there due to

complex interweavement and interrelations are virtually unlimited. They merely examine the correlation between tax change and intertemporal forest allocation under the assumption that all other reaction possibilities are excluded. This, however, is not a statement about the world, but about a possible correlation. Without the Ceteris–Paribus analysis technique, it is not possible to uncover isolated relations between cause and effect.

This exactly is the result in the Faustmann laboratory, to recognize individual correlations in a forestry of prices under strictly controlled conditions. Not more, no less.

Equilibrium as non-intended result of individual welfare maximization

The constant conditions in the Faustmann laboratory correspond to the total Walrasch equilibrium in economics. They are a prerequisite, that a certain type of reaction, namely the reaction of a variable to the change of another variable, is able to take place at all within the laboratory forestry.

But why is it that the variables within the Faustmann model (Faustmann formula and FPO theorem) are striving toward equality? Why, for example, will the optimal rotation time rise with a reduction in timber prices?

The equilibrium, here the partial one, has been much discussed and much mystified, as well. The creation of an economic equilibrium is not the intended result of actions of individuals, who react to changes in external variables and try to make the best out of their lives, technically speaking, to maximize their individual wealth.

Speaking with David Friedmans example: the reason that waiting queues in front of supermarket cashiers are about of equal length (in equilibrium) is not because those waiting in line are passionate about this kind of geometric order, but because those who are waiting always try to join the shortest lineup. In this way, each waiting individual reduces the difference in the length of the queues (Friedman 1996).

Optimal rotation times rise with reduction in the timber prices, not because this has been calculated by some forestry economist, or because the owners of the forest have a penchant for economic equilibriums, but because it is no longer worthwhile for the owner of the forest to sell more younger and thinner trees than before at a profit. The result is that the average age of the remaining trees in the forest has increased. Thus, the optimal rotation time has increased. It is the result of the forest owner adapting to the new price situation.

However, the mathematics of the Faustmann–Pressler–Ohlin theorem explains this only formally. It shows us the solution for which we must find a logical explanation. And this is exactly the task of forestry economic theory.

Without a mathematic analysis, we could quickly fall into a logical trap: let us use the example of falling timer prices from above. Logically, one could conclude that, at reduced timber prices, forest owners must cut down more trees in comparison with previously to safeguard their minimum incomes. At first glance, this explanation seems to be just a true. At second glance, our brain has subconsciously introduced an additional condition. It can be found with the aid of mathematics. The interested reader is welcome to give it a try.

The attempts of a individual toward increasing his own wealth prompt him to continually search for differentials (disequilibriums), e.g., in queues at supermarket checkouts, in differences of yield between various forms of land use or forest management systems or possibilities of achieving income by cutting down trees. The exploitation of differences (disequilibriums) results in their reduction, which is then described as "tendency toward equilibrium." The equilibrium is the unintended, but deductively necessary consequence of the attempts of individual to maximize their wealth in disequilibrium situations, but not the reverse.

If equilibrium analyses and maximization tasks are frequently substituted for each other, this is for formal mathematical reasons alone. Since both approaches in many cases lead to the same result (Samuelson 1983: 21), the analyst may resort to the technique that is easiest to handle. This means that, if economic scientists apply the equilibrium analysis instead of the individual maximization approach, this is owed to the mathematical simplification and not to the underlying world philosophy of an (eternal) state of equilibrium.

In this case, too, applies: the partial equilibrium analysis with the aid of the Faustmann model is not an instruction toward the achievement of an equilibrium in forestry in an equilibrium world, but an examination method for the analysis of cause–effect relations. Moreover, it is not even necessary to understand an equilibrium situation, but a disequilibrium situation.

For many years, it has been the only access to understanding the actions of people in disequilibrium situations, i.e. in situations in which external changes require adaptation efforts. Meanwhile, results from the laboratories of experimental economics prove impressively, first, how well the adaptation efforts of real people can be represented as maximization and, secondly, how quickly these adaptations of disequilibrium situations lead to economic equilibriums (Smith 2002).

Maximization as anonymous interaction

Economics is not about human actions. Economics is about human interactions.

Then why do we use the individual maximization approach in the Faustmann model? By doing so, are we not modeling an individual action? Admittedly. But where is the interaction in this?

The major misunderstanding consists of the equalization of interaction and interaction intended by the individual.

We have already dealt indirectly with the unintended interaction in the second section, when we used Milton Friedmans pencil example. We showed that the manufacture of a pencil and its sale requires cooperation, a form of human interaction, possibly of thousands of persons. At the same time, we pointed out that an individual buying a pencil is rarely aware of this thousandfold interaction, which nevertheless exists to a full extent.

Frequently, only the lived, experienced, direct interaction is understood as an interaction at all. This perception results from the experiences of the non-anonymous group. However, large modern societies are not only distinguished by non-anonymous networks and non-anonymous interactions existing therein, but at the same time by numerous anonymous connections. However, these are not readily recognized by individuals. The reciprocal character between the actions of complex interacting individuals is recognized to an even lesser degree. Prices and other results of interaction appear as exogenous parameters to the individual, but not as a result of their own actions and also not influenced by their own actions at any rate. At best, so the logical consequence, the individual may adapt to the exogenously created situation (Brennan and Buchanan 1993: 1 et seq.).

This is re-enacted with the approach of individual maximization: in the Faustmann model and in all other individual action models, interactions are modeled in such a way, as if single individuals (individual forest owners) are not able to influence the complex interaction, but at the most are able to adapt to it.

Thus, action theory, the maximization of individual wealth under restrictions, must be understood as a specific form of interaction theory. This has to do with our fundamental ideas of economics as a social science (Homann and Suchanek 2000: 26 f): Economics is about interactions, but not about actions.

Economics identify the problem cases in which the gains from interactions are missed systematically. The answers are not seen in the paternalistic change of the individual value system, but in the search for obstacles that make interaction more difficult or prevent it from taking place altogether. With the Faustmann model, we do not aim to explore how Robinson Crusoe allocates the forest on the desolate island to his current and future consumption (Brennan and Buchanan 1985: 1; Homann and Suchanek 2000: 404 et seqq.).

The reason we emphasize this so strongly is because the perception that economics is primarily a theory for action leads to the systematic misapplication and systematic misinterpretation of the institutional entity of the competitive market, as has been strikingly shown by Hayek (1948).

The fact that the maximization task formulated with the aid of the action theory should at the same time be an interaction theory cannot be recognized as easily as the interactions in non-anonymous groups modeled with the aid of games theory. In order to bring this to light, one must leave the step of trade and enter the step of institution, on which, for example, property rights and associated coordination rules are agreed upon (Brennan and Buchanan 1985: 2). Only when this step is reached, the interaction character of maximization tasks with price "parameters" becomes apparent, because that is where conditions for action (Homann and Suchanek 2000: 41 et seq.), or, technically speaking, the model conditions of the maximization task, are the subject of the analysis. Whether only timber proceeds are considered in the Faustmann model, or in addition, proceeds from the sale of access rights (recreation) or proceeds from the forest configuration for the creation of biodiversity can be realized, is not a question of individual maximization, but an institutional question.

The optimal actions for one and the same forest owner will be completely different, depending on what individual rights the ownership of the forest comprises, and if these rights may be traded. Should the ownership of the forest include access rights or the right of free design of forest (and thus the right to create biodiversity or not), this will generate entirely different interaction results and completely different effects on the wealth of the forest owner, in comparison with a forest property that does not include these two rights.

This means, that the interaction character of individual actions by individuals in anonymous groups is not expressed in their adaptation actions themselves, but in the superimposed configuration of institutions, which naturally are also the result of the actions of individuals.

One may formulate as follows: while the "forestry of prices" represents the more comprehensive concept of thought of the institution "competitive market", the Faustmann model deals with the individual adaptation processes of anonymous interactions within this institution. The Faustmann model is completely imbedded in the concept of thought of a forestry of prices. Or, in terms of Homann and Suchanek (2000): the concept of thought of a forestry of prices provides the action conditions for the Faustmann model, insofar, one limits oneself to anonymous interactions.

Because with the aid of the Faustmann model, no assertions can be made about the interrelations of cause and

effect of interactions in non-anonymous groups, in which strategic behavior predominates.

To come back to the above metaphor of Robinson Crusoe, one may further formulate: the Faustmann model does not allow us to explore how Robinson and Friday jointly divide the forest between their current and future consumption. Using the Faustmann model, we can only explore how the forest is divided between current and future consumption on an island on which millions of Robinsons live.

In conclusion, to venture making a comparison to reality: real forestry, like the reality in other branches, as a rule is neither just anonymous nor just non-anonymous, but carries characteristics of both types of groups within itself at the same time. This time, once again, the Faustmann model is not understood as a "miniaturized version" of real forestry, but as a method for the acquisition of "pure" assertions for the "pure" anonymous large group not mixed with strategic action.

Adaptation and discovery

In his famous essay "Competition as a Discovery Procedure", Hayek (2002) reminds us, "that the justification for using the price mechanism is solely that it shows individuals that what they have previously done, or can do now, has become more or less important, for reasons with which they have nothing to do. The adaptation of the total order of human action to changing circumstances is based on the fact that the compensation of the various services changes without taking into account of the merits or defects of those involved." (Hayek 2002: 17) In the Faustmann laboratory, individuals adapt to price changes by changing the rotation times of their forests or changing the land use, either by changing the silviculture or by selecting a non-forest alternative. However, for that purpose, the best choice must already be known or at least the choice that is determined to be optimal must already be included in the optimization model.

However, with the title of his essay, Hayek wants to draw our attention to the fact that market competition is a means to identify the best adaptation possibilities to unforeseen changes. If we already knew them, as the maximization approach suggests, competition would be redundant.

And herein lies a significant methodical limitation of the Faustmann model. In the same way, we cannot recognize Darwins evolution with experiments in the greenhouse laboratory, just as little are we able to study in the Faustmann laboratory the emergence of new silvicultural and other possibilities through competition as an answer to unforeseen changes. The maximizing homo economicus adapts by emulation. However, new circumstances require a discovery process. But, homo economicus cannot discover anything. The stage is ready for Joseph Schumpeter's entrepreneur (Schumpeter 1993). However, such a model change should be left to a subsequent study.

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